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THE SYSTEMATIC RELATIONSHIPS OF THE PALEANTARCTIC SIPHLONURIDAE (INCLUDING ISONYCHIIDAE) (EPHEMEROPTERA)[1]

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The primitive mayflies of the family Siphlonuridae (including Isonychiidae) of Australia, New Zealand, and southern South America are of great interest to ephemeropterists, but their interrelationships never have been clearly understood. Recent works by Demoulin (1955, Bull. Inst. Roy. Sci. Nat. Belg. 31(22): 1-15; (58): 1-16) and Riek (1955, Austral. Jour. Zool. 3: 266-280, 2 pls.) have helped to clarify the systematics of the group.

On the basis of the morphology of the nymphs there are four remarkably distinct groups, each represented by one genus in each of the three land masses, except that one of the groups has two representatives in South America. Although the groups are easily characterized in the nymphal stage, the definition of these groups in the adult stage is difficult, primarily, it is hoped, because of inadequate knowledge of the family.

The Siphlonurinae are represented by three genera which have very similar nymphs, *Nesameletus* in New Zealand, *Ameletoides* in Australia, and *Metamonius* in South America. The Oniscigastrinae are represented by the remarkable *Oniscigaster* in New Zealand, *Tasmanophlebia* (=*Tasmanophlebiodes*) in Australia, and *Siphlonella* in South America.

A third group is represented by mayflies with peculiar carnivorous nymphs having threadlike multi-segmented labial and maxillary palpi. This group is represented by *Ameletopsis* in New Zealand, *Mirawara* in Australia, and *Chiloporter* and probably *Chaquihua* in South America. The relationship between *Ameletopsis* and *Chiloporter* is quite obvious. Demoulin (1952, Bull. Ann. Soc. Ent. Belg. 88: 170-172) at one time considered these genera synonymous, but they were restored to generic status by Edmunds and Traver (1954, Proc. Ent. Soc. Wash. 56: 236-240). The genus *Mirawara* of Australia was included by Edmunds and Traver (*op. cit.*) in the family Isonychiidae without critical study because of the statement by Harker (1954, Trans. Roy. Ent. Soc. London, 105: 251) that the genus was related to *Coloburiscus*. Riek (*op. cit.*) has since described the nymph of *Mirawara* and revealed the relationship to *Ameletopsis*. The nymph of *Mirawara* is almost certainly the one which Tillyard (1933, Proc. Linn. Soc. N.S. Wales 58: 5) reported as *Ameletopsis* in Australia. More recently Demoulin (1955, Bull. Inst. Roy. Sci. Nat. Belg. 31: 11) has described a new genus, *Chaquihua*, which is apparently related to *Mirawara* and is therefore placed in the Isonychiidae. The nymph of *Chaquihua* is unknown, but some *Ameletopsis*-like nymphs in the California Academy of Sciences Collection, collected west of

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Angol, Chile by Ross and Michelbacher are probably the nymphs of *Chaquihua*. The wing pads have *Chaquihua* type venation, but reveal no angular costal projection at the base of the hind wing. In Demoulin's (*op. cit.* :15) summary of the genera of the Siphlonuridae and Isonychiidae, he places *Chiloporter* and *Ameletopsis* in the Siphlonuridae and *Mirawara* and *Chaquihua* in the Isonychiidae. I propose that the four genera form a **new subfamily, Ameletopsinae,** in the family Siphlonuridae.

The isonychiine mayflies are represented by *Coloburiscus* in New Zealand, *Coloburiscoides* in Australia, and by *Murphyella* in South America. These nymphs have such common features as maxillary and coxal gills, the forelegs with long setae, and similar mouthparts. The abdominal gills have a fibrilliform tuft in *Coloburiscoides*, but not in *Coloburiscus; Murphyella* nymphs have no abdominal gills.

The isonychiine mayflies are still not adequately characterized in the adult stage, and from a practical standpoint it is probably best to regard them as a subfamily of the Siphlonuridae. Burks (1953, Bull. Ill. Nat. Hist. Surv. 26(1) : 108) originally proposed the group as a subfamily of Baetidae, but Edmunds and Traver (*loc. cit.*) raised the group to family level. The isonychiine branch most certainly originated from the Siphlonuridae, but after branching from this group has apparently been ancestral to two distinct families, the Heptageniidae and Oligoneuriidae. Because the isonychiine branch was the probable ancestor of these families, Edmunds and Traver (*loc. cit.*) felt that the group should be regarded as a full family. Although this still appeals to me from the theoretical standpoint, it is not a regular practice in classification. For example, the reptilian stem which was ancestral to the mammals is not placed as a separate class from the reptiles because it was ancestral to another class, the Mammalia. For this reason I am inclined to now regard the Isonychiinae as only a subfamily of Siphlonuridae.

In view of the clarification of relationships of the paleantarctic Siphlonuridae, the following table summarizes the systematic and geographical relationships of the genera. A similar table published by Demoulin (*loc. cit.*) summarizes his impression of the relationships as viewed prior to the publication of Riek's (*op. cit.*) paper on the Australian Siphlonuridae.

Groups of Siphlonuridae	South America	Australia	New Zealand
Siphlonurinae	Metamonius	Ameletoides	Nesameletus
Ameletopsinae	Chaquihua	Mirawara	Ameletopsis
	Chiloporter		
Oniscigastrinae	Siphlonella	Tasmanophlebia (=Tasmanophlebioides)	Oniscigaster
Isonychiinae	Murphyella (=Dictyosiphlon	Coloburiscoides	Coloburiscus